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INNOVATING PEDAGOGY 2021

**Exploring new forms of teaching, learning and assessment,
to guide educators and policy makers**

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Elizabeth FitzGerald, Mark Gaved,
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Julia Sargent, Eileen Scanlon, Jinlan Tang,
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Open University Innovation Report 9

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Executive summary

This series of reports explores new forms of teaching, learning and assessment for an interactive world to guide teachers and policy makers in productive innovation. This ninth report proposes ten innovations that are already in currency but have not yet had a widespread influence on education. To produce the report, a group of academics at the Institute of Educational Technology at The Open University, UK, collaborated with researchers from the Artificial Intelligence and Human Languages Lab/Institute of Online Education at Beijing Foreign Studies University. A long list of new educational concepts, terms, theories and practices was proposed and then pared down to ten that have the potential to provoke major shifts in educational practice. Finally, ten sketches of innovative pedagogies were compiled, based on a review of published studies and other sources, and they are summarised below.

1 Best learning moments: The idea of best learning moments builds on the psychological concept of cognitive absorption, or ‘flow’, defined as deep involvement or immersion in an activity or task, often accompanied by feelings of enjoyment. People experience this mental state and these feelings when engaged in an activity that is appropriately challenging to their skill level, resulting in full concentration and focus. Best learning moments can result in deep learning and high levels of satisfaction, and they may also be particularly memorable. They may occur in situations involving hands-on activity and participation, and they fit in well with learner-centred approaches that take individual differences in learning into account. Teaching tips for creating memorable moments include talking about students’ interests, asking challenging questions and accepting that all students are different. Technology-enhanced learning environments can be designed to create opportunities for best learning moments – for example, through use of mobile devices, games-based learning and immersive experiences, and through using data from learning analytics. New ways of capturing best learning moments can support reflection on learning and improving the design of learning technology. Best learning moments can also be opportunities for ‘teachable moments’, which are unplanned opportunities that arise

when a teacher senses that students are engaged and ready to absorb some insights, such as a general point from a shared experience.

2 Enriched realities: It is increasingly common to enrich reality with the use of technology, and several types of reality can be blended. When learners cannot be in the same place at the same time, augmented reality (AR) and virtual reality (VR) can be used to make some exciting and memorable shared experiences possible. When an AR application is used, it overlays information on our surroundings or objects around us, while VR provides a three-dimensional environment with which learners can interact. Such enriched realities extend what is possible in education and training and provide dynamic, new experiences that engage learners immediately. They also open up opportunities that are not available in the classroom, such as exploring places that would be difficult, dangerous or impossible to visit for a learner – the surface of Mars or the inside of a volcano, for example. With AR and VR, students can interact and work together, manipulating virtual objects and moving around the setting together. These ways of engaging can support them in understanding concepts, practising skills and performing various tasks or procedures. Enriched realities are now used in many contexts including clinical and medical settings, safety training and teacher

training. Small-scale use of enriched reality is within reach for learners with access to a suitable smartphone and a good internet connection.

3 Gratitude as a pedagogy: Gratitude involves the acknowledgement of what people have or receive and the conscious action of wanting to give back in some ways. When applied in an academic context, gratitude can help students to improve student–teacher and student–student relationships; it can help them to be more aware of their learning environment and increase understanding and focus on their studies. It can also improve mental health and wellbeing of both students and teachers – for example, students improve their ability to remain resilient while facing difficulties in learning. One practical approach to implementing gratitude as a pedagogy involves asking teachers and students to examine their attitude before starting their teaching or learning and during learning activities. A more detailed reflection can bring awareness of any negative attitudes towards certain topics or learning activities. These are then analysed and replaced by elements of gratitude. Students have reported being more engaged and less distracted, having great motivation for learning, and having increased confidence and a deeper understanding of concepts. Gratitude as a pedagogy has been increasingly included in the professional development of school teachers, used in early childhood education and explored in medical practice.

4 Using chatbots in learning: Using a text-based or voice-based conversational interface to communicate with the user, chatbots can answer and ask questions, guide learners and assist in problem solving. This means that, when a teacher is not available or cannot help, learners are still able to make some progress. Increasingly, chatbots use artificial intelligence techniques to understand human languages, voices, body language and behaviours, and to

make sense of patterns in languages or behaviours. Chatbots bring new opportunities, such as immediate problem diagnosis and interventions. They can provide learners with support tailored to their needs – for example, constructing an immersive learning environment, analysing requirements and initiating supportive conversation. Studies suggest that learners might express themselves more freely with chatbots as they are not interacting with humans who might judge them. Chatbots have brought opportunities when tackling the contradiction between large-scale and high-quality in learning. They enable greater personalisation by collecting data from dialogues and learners' behaviours to provide support that is specifically tailored to each learner's requirements, which might also help reduce educators' workloads. However, chatbots may not meet expectations if learners are not tolerant of their shortcomings, such as a limited capacity to handle misunderstandings and breakdowns in a conversation. Ethical issues such as who owns and has access to conversations between chatbots and humans also need to be addressed.

5 Equity-oriented pedagogy: Developing educational opportunities that are inclusive requires thinking not only about equality in opportunities to access education but also about equity, whereby each student can achieve similar positive outcomes, regardless of their background and characteristics such as gender, disability or ethnicity. Finding fairer ways to improve learning for all requires consideration of barriers at many levels, from personal to cultural and societal. Strategies in equity-oriented pedagogy include listening to students and adapting teaching, recognising uneven impacts of use of educational technology, awareness of how assessment practices can be unfair and drawing on pedagogical frameworks such as Universal Design for Learning (UDL). UDL seeks to

accommodate individual learning differences and provides principles of curriculum design that focus on offering students multiple means of engagement, representation (e.g. alternative formats) and expression or action. New technology and increased online and hybrid learning provide opportunities for increasing personalisation and co-creation of learning, although possible inequitable effects of technology must be considered. Where the focus is on developing individualised support for learners, this should not reduce the social benefits of learning together or unintentionally create new barriers. By putting a focus on fairness, rather than on whether access is possible, equity-oriented pedagogies can offer a more holistic approach when considering inclusion.

6 Hip-hop based education: Hip-hop based education focuses on the use of hip-hop as a musical genre, culture and art movement, both inside and outside a traditional school setting. It uses elements such as rap music texts, videos, graffiti and breakdancing in curricula and in teaching and learning to provide a culturally appropriate approach that can empower marginalised groups of learners. Educators, scholars and students involved in hip-hop education challenge traditional educational systems and structures and attach particular value to the power of youth voice, culture and agency. Hip-hop based education requires critical reflection to ensure that both teachers and students maintain an authentic learning experience and a critical perspective. As well as incorporating elements of hip-hop into teaching and learning, it is important that teachers involve students in critically examining negative aspects of hip-hop that may reinforce or encourage sexism or violence. Hip-hop based education has been shown to bring benefits that include greater student engagement, motivation and social and

emotional learning; increased literacy development and critical thinking; and improvement in teacher and student relationships. It is studied within disciplines such as English, sociology, linguistics, dance, anthropology and music. It has practical applications from early years learning through to higher education levels of study.

7 Student co-created teaching and learning: The co-creation of teaching and learning materials by teachers and students can lead to greater empowerment of students and better relationships. Students can share responsibility with teachers for designing materials and activities as well as assessments. They can co-create new content and experiences or amend existing ones. The approach resembles ‘communities of practice’, whereby a group of people come together, linked by a common interest, and meet regularly in order to find ways of improving their practice. As students participate in the co-creation activities, they negotiate with others and form and evolve their identities. Examples of co-creation range from small group activities, often relating to specific courses, to larger-scale involvements such as surveys, interviews, consultations, testing of materials, workshops and critical reading of course content. Barriers to uptake of this approach include the need for students to have specific skills or expertise, and a concern that their involvement may change the direction of content creation from what was originally planned. There may also be frustration when the process does not work smoothly, and there is a risk that co-creation may not involve all students, thereby contributing to feelings of exclusion. When co-creation works well, students often report positive feelings of enthusiasm and involvement and they can acquire new skills. Co-created materials may also save them having to buy expensive textbooks.

8 Telecollaboration for language learning: Learning a second language can bring many advantages, such as an increased likelihood of attaining further education, work and professional collaboration. The availability of free-to-use online communication tools has created new opportunities for authentic contexts for language learning and cultural learning, in the form of telecollaboration projects that connect learners in different locations. Telecollaboration enables a student to tutor another in their first language, while also learning their collaboration partner's language as part of the same exchange. Such projects may be formally supported within an educational institution or informal. Telecollaboration has been found to improve learners' communication skills, expand their vocabulary and grammar knowledge, and help them to appreciate other cultures and to use their second language accurately and appropriately. Records of telecollaboration may be useful for follow-up tuition or task improvement. The quality of the learning opportunities in telecollaboration is dependent on learners' commitment and motivation, and learners and teachers may need to be trained in telecollaboration principles and strategies. Some learners have reported cross-cultural tensions when working on language tasks. Overall, telecollaboration can contribute to building a student-centred learning environment characterised by peer teaching, autonomous learning and tailored learning based on learners' personal interests and needs.

9 Evidence-based teaching: Evidence-based teaching is about using research evidence to inform decisions about the best pedagogical approach to apply in a given domain. These decisions may relate to which teaching strategy to adopt to be able to teach a specific topic, capturing the progress students make over time, or assessing the effectiveness of one's teaching. The

idea originates from medicine, where practitioners often make use of evidence from research and experimental studies which they combine with information about their patients to make decisions about managing their health. Evidence-based teaching examines evidence from research to determine whether there are proven benefits from a given pedagogical approach, or the conditions under which an approach will work. For example, robust evidence now exists that supports the provision of good-quality feedback, the development of skills that can help students understand how they learn, and giving homework to students. Several national and university-based centres design and implement studies that examine in a systematic manner which pedagogical techniques are beneficial, how different approaches to teaching are perceived by students and what their impact may be on what is learnt. Evidence-based teaching can support teachers in identifying and applying best teaching practices, debunking harmful myths about teaching and improving current teaching and learning. A good strategy is for researchers to work closely with teachers to reflect on their needs, design studies and produce evidence together.

10 Corpus-based pedagogy: A large collection of texts or other samples of naturally occurring language – for example, a collection of newspaper articles across several decades or a collection of informal conversations – is known as a corpus. Language teachers, students and developers of teaching materials may access a corpus to obtain authentic linguistic data and devise corpus-based tasks for teaching and learning. Corpus-based pedagogy has received attention in recent years as a result of advances in computing science that facilitate extraction of information from a corpus – for example, to find out how certain words are used. Learners can access online corpora with or without the help of their teachers, and they can

analyse their own use of language by comparing their linguistic choices with the patterns and structures retrieved from a corpus. The retrieval and analysis of language use in context thus provides learners with a research-based understanding of language forms and functions. The corpus-based approach can be applied in many areas including learning languages for specific purposes, teaching text analysis, support for writing

in a particular genre, and scrutiny of existing textbooks to discover their features and to suggest improvements. It can also enable comparisons between word usage or concepts in different languages to help develop cultural awareness. Researchers maintain that there is a need for more corpora that are accessible, diverse and adaptable for language instruction.

Introduction

This is the ninth in a series of annual reports on innovations in teaching, learning and assessment. The *Innovating Pedagogy* reports are intended for teachers, policy makers, academics, researchers, educational technology developers and anyone interested in how education may change in the years ahead.

This 2021 report is the result of collaboration between researchers from the Institute of Educational Technology at The Open University (UK) and the Artificial Intelligence and Human Languages Lab/Institute of Online Education at Beijing Foreign Studies University. The report introduces ten innovative pedagogies that either already influence educational practice or offer opportunities for the future. By ‘innovative pedagogies’, we mean novel or changing theories and practices of teaching, learning and assessment for the contemporary world, often enabled or supported by technology.

As in previous years, the process of writing this report has involved sharing ideas; discussing innovations; reading research papers, reports and blogs; and commenting on each other’s draft contributions. We worked together by first listing new educational concepts, terms, theories and practices, then reducing these to those that have the potential to bring about major shifts in educational practice. This report series has been published annually since 2012, so the selection of the ‘top ten’ pedagogies for the report is also guided by the fact that we do not want to repeat pedagogies we have presented previously, even if they are only now starting to be recognised more widely as emerging trends.

The pace of innovation and the ability to adopt new practices differs around the world, and of course not every suggested pedagogy is suitable for every setting. Yet increasingly, innovative pedagogies display a shared propensity to promote connection and collaboration (including between students and teachers), taking learning beyond classroom walls into a virtual space and enabling participants to reach out to others who may be on the other side of the world. Several pedagogies also display a trend towards

foregrounding positive attitudes that can help people to navigate an uncertain environment.

Challenges in emergencies

Work on this report began in May 2020, at a time of great upheaval and disturbance to normal ways of conducting education, brought about by the Covid-19 pandemic. The pedagogical innovations described in our report are not a direct response to the challenges that so many educators have faced because of this extraordinary situation, but they are certainly relevant to those challenges.

The pedagogies we settled on seem to reflect some important sensibilities and concerns that were being highlighted in discussions among educators and policy makers during 2020. Restrictions on human contact had put the spotlight on personal wellbeing and its impacts on people’s ability to teach and study. Efforts were redoubled to understand teachers’ and students’ personal circumstances and needs. What was learnt highlighted issues of social justice and equity, such as uneven access to teaching materials and suitable spaces, support and technology. Just as knowledge-generating communities within science, medicine, healthcare and other disciplines were called upon to provide reliable evidence to inform important decisions relating to managing the pandemic, similar requests were made to various communities in the field of education.

Those with a great deal of experience in technology-enhanced and distance learning have been able to point to successful approaches, implementations and designs supported by evidence from research and practice. In response to a growing demand for information on teaching at a distance, the Institute of Educational Technology had already shared online a subset of our

innovative pedagogy descriptions from previous years, in the form of help sheets for people who are trying out distance and online education for the first time, or who have already taught at a distance and want to try something new¹. Many institutes, organisations and governments around the world have provided other resources for distance education and emergency remote teaching^{2, 3, 4}.

Wellbeing at the heart of education

Several of the pedagogies outlined in this report promote awareness of the role of attitudes and emotions in teaching and learning. Educators want their students to pay attention in class but, ideally, they want more: students should have the right attitude, and they should be fully engaged and deeply absorbed in their learning experience, since that will lead to higher levels of achievement and satisfaction. **Gratitude as a pedagogy** suggests reflecting on attitude in order to bring about improvements in wellbeing, relationships and learning. Practising gratitude has been shown to lead to an increase in students' ability to focus in class and to remain resilient when facing difficulties, while teachers have been better able to deal with stress. The approach seems highly relevant in times of adversity and the positive feelings it generates may go some way towards counteracting the emotional anxiety and cognitive stress brought on by uncertainty and insecurity at the present time.

Research suggests that people learn best when they are in a mental state that makes their learning easier or more enjoyable.

Best learning moments use heightened attention and engagement signalling positive mental states that can lead to enjoyable and effective learning. Although the concept of 'cognitive absorption' (a state of deep or total involvement) has been explored in the past in relation to many human activities including learning, the 'best learning moments' approach uses this concept as a way to promote noticing such occurrences as opportunities to intensify and sustain learning, or to capture learning incidents and reflect

on them later. Best learning moments may occur – though by no means exclusively – when learners are using some technology-enhanced learning applications that have been designed for an excellent 'learner experience'. These might be applications or environments that extend learning with augmented and virtual reality. **Enriched realities** provide experiences that engage learners immediately. Learning environments using enriched realities offer remote participation and exploration, trips back in time or into the future, virtual rehearsals and clinical simulations. Such experiences can build confidence and lower the risk involved in a difficult procedure or activity, which might also reduce anxiety.

Social justice and student participation

It is perhaps no coincidence that several pedagogies in this report are concerned with providing fair chances and enabling greater student participation. In open- and distance-learning contexts, these have long been cherished aims and have led to innovations such as openly available online courses taken by very large numbers of people who would otherwise miss out on learning opportunities. **Equity-oriented pedagogy** has a focus on inclusivity, going beyond opening up access to education and asking how every student in a class (or cohort or programme, etc.) can achieve similar positive outcomes, regardless of their background and characteristics such as gender, disability or ethnicity. A pedagogical orientation towards equity requires teachers to really listen to students, challenging them to address inequalities that may be created by some examinations and assessments as well as by uneven access to, and ability to use, technology.

One way to work towards fairness is through **student co-created teaching and learning**, which can lead to greater empowerment of students and better relationships among students and between students and teachers. Co-creation can be direct, through joint activities such as production of learning materials and design of assessments, or indirect, by way of opinions, suggestions and

feedback offered through multiple means including surveys, testing of new course materials and critical reading of course content. Consideration should be given to whether students have the necessary skills and competencies needed for full participation, and how these may be developed. It may be appropriate to work on developing a culture of participation, so that it becomes a natural and expected part of being a student. As part of this process, there would be opportunities to discuss benefits and drawbacks, how to handle conflicts, and ways in which everyone can be included.

Where students are already immersed in a distinctive culture outside class, elements of their experiences and traditions can be brought into class and incorporated into course materials and curricula. As an example, hip-hop based education connects with hip-hop as a musical genre, culture and art movement, using elements such as rap music texts, performances, videos, art and dancing. Apart from improvements in teacher and student relationships, the benefits of a **hip-hop based education** include greater student motivation, engagement, social and emotional learning, literacy development and critical thinking.

Expanding connections and collaborations

The idea of building relationships and expanding opportunities for interaction and cultural learning comes into play in other pedagogies, notably **telecollaboration for language learning**. By connecting learners through free-to-use online communication tools and environments, collaboration at a distance gives learners opportunities to practise using a foreign language and to expand their understanding of other cultures, while also taking on the role of an informal teacher of their first language (or another language in which they are proficient). By working on joint 'projects', pairs or groups of learners can proceed at their preferred pace and in good alignment with their common

areas of interest and need. Just as in other, possibly unfamiliar collaborative activities such as the content co-creation mentioned earlier, students are likely to need some targeted development in terms of their collaboration or creation skills and some strategies needed for handling tensions between participants or conflict resolution. Making such skills and strategies explicit to learners may also be a new challenge for some teachers and for those who are designing skills courses for students. Such skills developed in the safe environment of a telecollaboration project could also be valuable for wider application in other contexts, such as interactions on social media platforms that may be used for language practice, peer support or other purposes.

Another growing area of opportunity is using **chatbots in learning**. These tools, based on artificial intelligence (AI), could enable language practice via simple activities like asking and answering questions, through to more advanced conversation designs, such as enabling a learner to participate in a story by responding to choices offered by the chatbot. Chatbots are currently mainly designed for individual interactions, but in future they could support more collaborative dialogues. For example, the Wysa chatbot⁵, which offers anytime chats with an artificial agent to alleviate loneliness, stress or anxiety, also offers to bring a (real) therapist into the conversation at the user's request. By analogy, when a teacher is not available, learners can talk with a suitably designed chatbot and are thus enabled to resolve some queries or make some progress with their learning, and could call on the teacher or another helper when they are available or when the need arises. Chatbots are still imperfect and may not meet learners' expectations if there are misunderstandings and breakdowns in a conversation, but they are increasingly used in commercial contexts and healthcare, and the repertoire of their application areas is rapidly growing.

Evidence-based and data-based practice

Choices are often made based on established practices. One basis for pedagogical and technological decisions is using what is already known to work, even if it does not necessarily work exceedingly well. When there is a need or opportunity to change or adopt something new, we may look for evidence that will support our choices. Evidence from research studies is not always easy to find, the findings can be hard to interpret, and the whole process can be time-consuming, yet compared with past generations, many teachers have greater access to evidence from research, which suggests that they could engage more with **evidence-based teaching**. While it may not be possible to source reliable evidence for every aspect of pedagogy, it now exists for such aspects as good-quality feedback, the development of skills that can help students understand how they learn, and conditions that make homework practices more effective. This report recommends that researchers work more closely with teachers to reflect on their needs for research, design studies together and produce evidence in whatever forms would be useful for practice.

The evidence-based approach is also visible in pedagogies that make use of large collections of data sets and corpora (collections of texts or recordings). In **corpus-based pedagogy** for language learning and linguistic investigations, the retrieval and analysis of language use in context – for example, in a corpus of recorded conversations – provides learners with a research-based understanding of language forms and functions. Learning tasks can be designed to help learners explore word forms, uses and combinations, supported by increasingly intelligent tools that can provide different views of the corpus data. Language learners, as well as international students in a variety of disciplines, can develop their autonomy by analysing their own use of language and comparing their linguistic choices with the patterns and structures found in a corpus. Exponential growth in collections of research studies, and slower but steady growth in large collections of texts and recordings, create opportunities for teaching and learning, but they also call for new skills, analysis tools and adaptations in pedagogical practices.

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Best learning moments

Positive mental states for enjoyable and effective learning

Potential impact: [Medium](#)

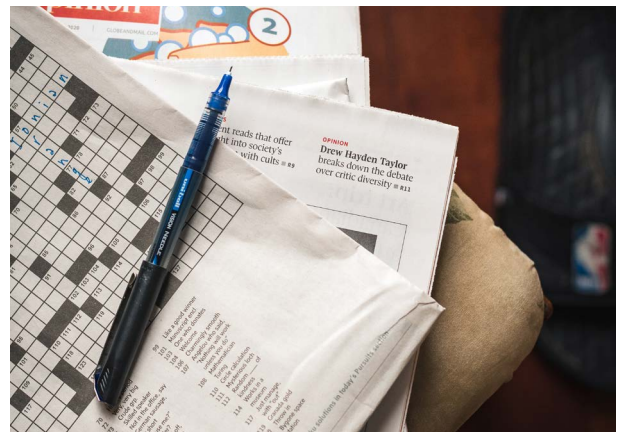
Introduction

Our ability to learn is connected to our state of mind. We may feel alert and ready to take on a new activity, or we may be feeling distracted or anxious and be unwilling to engage. Research suggests that people learn best when they are in a mental state that makes their learning easier or more enjoyable. Examples of positive mental states in the context of learning are the feelings of curiosity, interest, engagement, happiness, optimism, confidence and calmness. A person experiencing a best learning moment might have higher-than-average feelings of interest in a task and will be able to respond with appropriate skills to a challenge presented by the task¹. These moments can result in deep learning and high levels of satisfaction.

Best learning moments, also referred to as 'optimal learning moments', are an emerging topic of current importance for several reasons. One reason is that there are reports of heightened attention and engagement when using some technology-enhanced learning applications, and these states of mind can contribute to more effective learning. Best learning moments may also be particularly memorable, since strong emotions contribute to the formation of long-term memories. Therefore, long-term retention in memory may be enhanced. Another reason is that there are new ways of capturing or recording best learning moments and using them for reflecting on learning or improving the design of learning technology. Finally, best learning moments align well with learner-centred approaches that take into account individual differences in learning.

Background

The idea of best learning moments builds on the psychological concept of cognitive absorption² or 'flow'³, which is defined as deep involvement or immersion in an activity or task, often accompanied by feelings of enjoyment. A 'Music Paint Machine' that enables musicians to paint a picture by playing their instrument has been shown to have the potential to turn the experience of playing music, moving and drawing into an optimal flow experience⁴ where the individual may feel as if they are transported into a new reality. These are mental states and feelings that people experience when engaged in an activity that is appropriately challenging to their skill level, resulting in full concentration and focus.



Interest, challenge and skill: learning words while absorbed in a crossword puzzle.

“

mental states and feelings that people experience when engaged in an activity that is appropriately challenging

”

In leisure time, feelings such as boredom or curiosity can lead individuals to look for an enjoyable challenge and develop their skills to be able to meet that challenge. Activities that people choose to do in their leisure time, such as painting, composing music, doing a crossword or taking part in sports and rituals, may create good conditions for best learning moments. The process of recognising a challenge and applying or developing necessary skills leads to discovery and growth. The person may be so absorbed in what they are doing or experiencing that they lose all sense of time. Such a state of cognitive absorption may last a long time, although not necessarily.

Best learning moments may occur in situations involving hands-on activity and participation, such as when trainee medical staff are with patients rather than at their workstations⁵. Although listening, watching and reading also commonly result in a state of absorption and positive feelings, without the elements of appropriate skill and challenge they might not result in learning. Researchers investigating learning in science subjects (biology, chemistry and physics) at secondary-school level have expressed the hope that 'optimal learning moments' might motivate individuals to seek similar types of experiences in the future¹ and will encourage more students to study science subjects.

Best learning moments could also be opportunities for 'teachable moments'. A teachable moment is an unplanned opportunity that arises when a teacher senses that students are engaged and ready to absorb some insights. For example, the teacher may be able to make a general point from a shared experience. The teachable moment is a fleeting opportunity that is sensed and seized by the teacher. Teaching tips for creating personally memorable moments for students include talking about students' interests, asking challenging questions and accepting that all students are different.

Other related concepts include breakthroughs and critical events in learning. These are moments when understanding of a difficult concept is suddenly achieved thanks to a

change in teaching method, such as when a computer simulation is used.

Best learning moments in technology-enhanced learning

Learning activities and technology platforms can be designed to create opportunities for best learning moments. This approach puts the learner at the centre of the learning process and focuses on the learning experience and its possible technological enhancement. It acknowledges the value of a person's enjoyment or satisfaction in their interactions with technology.

Designing the best possible 'user experience' with computer systems and applications includes considering the user's satisfaction (whether they will be satisfied with the system in their context of use) alongside other aspects such as ease of use, efficiency and effectiveness. Designing the best possible 'learner experience' for technology-enhanced learning (TEL) involves consideration of additional aspects, including the quality of the educational content and methods of evaluating learning. Many educators and TEL researchers believe that learners using a TEL system should find the experience engaging and relevant.

Designing TEL systems that can promote or encourage best learning moments is still a relatively new field, but there are several promising ways forward:

- Learning with mobile devices (mobile learning) offers good conditions for best learning moments because it highlights participation, personal contexts and sensory experiences⁷. A related idea within mobile learning is that of an 'opportune moment', when students have short bursts of time that they can use for learning in the course of their day. In this case, a mobile learning system might send a prompt or notification to a learner to alert them to a small amount of learning they can undertake, such as memorising vocabulary⁶. The learner then chooses whether or not to engage, which might depend on whether or not they feel it is the right moment.

- To engage learners, popular games-based TEL environments use multiple design elements, such as avatars and storylines, challenges, rewards and learning tools such as journals⁸. Successful game types include role-playing and fantasy games. Engagement in games is dependent on the design of the game but also on the players' attributes, which include their characteristics, personalities and motivations to play.
- Immersive experiences in virtual environments or when using social media are associated with freedom to explore, stimulation of the senses, adventure and novelty. These experiences can induce feelings of excitement, engagement and absorption. Individuals' personality traits play a role, with some being more eager than others to expose themselves to new situations and stimuli.
- Learning analytics data from online learning environments and other sources such as student surveys could help teachers, students, researchers and learning designers discover more about conditions supporting best learning moments.

Capturing best learning moments

How can we know when best learning moments have occurred? Currently most of the evidence comes from students and researchers. Students describing times when they experienced enjoyment, feeling happy, successful, confident or enlightened while learning, may be describing some of their best learning moments. Researchers have suggested that we need to focus on when an individual is experiencing higher-than-average feelings of interest, skill and challenge during a specific task and in relation to feelings such as happiness, enjoyment, confidence and a lack of boredom or confusion¹. Since any challenge may be perceived differently among students – some may welcome it, some may find it causes anxiety or stress – it seems there is a need for more research to

understand the idea of best learning moments from students', teachers' and researchers' points of view.

Best learning moments can be difficult to capture, although use of a mobile-phone app (for example, one designed specifically for 'experience sampling') is one way to enable students to record an experience very soon after it occurred. Using such a mobile-phone app can also enable students to spend a designated period of time reflecting continuously on their best learning moments, sharing their findings with others and discovering what works best for their peers.

Best learning moments are perhaps also those that are worth remembering, or those that tend to be captured in our memories. Strong and lasting memories of what was learnt tend to be associated with experiential or active learning, with events or people that students consider to be significant and with emotions they experienced at the time.

Conclusion

The idea of best learning moments provides a helpful focus for identifying what different people consider to be 'best' in a learning scenario. It encompasses several related ideas that have been around in education for a while. The best-learning-moments approach can be applied in teaching and learning in a casual way by simply asking students what they consider to be their best learning moments and drawing conclusions from their responses for the design of learning experiences for those individuals or groups. It can also be done in a more systematic way by capturing evidence of such moments and analysing their components to develop models of best learning moments for individuals or groups, for different disciplines and purposes. Best learning moments may empower students through personal and emotional development, reinforcing positive experiences and a recognition that learning can be enjoyable as well as effective.

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Enriched realities

Extending learning with augmented and virtual reality

Potential impact: [Medium](#)

Introduction

Setting up an experiment in the lab, exploring on a field trip, building a model together: these are exciting and memorable educational experiences for learners in the same place at the same time, but they pose a challenge during the Covid-19 global pandemic. Augmented reality and virtual reality make these shared experiences possible. They also open up opportunities that are not available in the classroom, such as experimenting with moon rock, exploring the depths of the ocean or working together to build a village.

It is increasingly normal to enrich day-to-day reality with the use of technology. Lenses in telescopes, microscopes and spectacles enable us to see things more clearly or to see the world in new ways. Portable music systems add a soundtrack to our lives. Scanning a QR (quick response) code with our smartphone links us to information about an object or a location. Millions of people around the world have been playing augmented reality games such as Pokémon Go for years. Many of today's college students have explored virtual worlds such as Minecraft and Club Penguin since they were small.

These days, several types of reality are blended. Day-to-day reality – or physical reality – is our normal experience. Augmented reality (AR) can be viewed through a device such as a smartphone. When we use an AR application on the device, it overlays information on our surroundings or objects around us. That information might appear as text, video, audio or graphics (for example, mythical creatures). Virtual reality (VR) is computer generated and typically experienced via a headset; it provides a three-dimensional environment we can interact with – for example, a place where we can move through a landscape, lift objects and chat with friends.

Augmented reality and virtual reality are not entirely new – educators were already using them in the last century. What *is* new is their increasing use in daily life, the falling prices of associated technology and the worldwide demand for interactive but – as demonstrated during the Covid-19 pandemic, for instance – socially distanced educational experiences. Together, these factors make it important to review what we already know about enriched realities, to consider how they can be used to support learning without massive investment in technology and training, and to look forward to possibilities that are currently being trialled.

What enriched reality can offer

Enriched reality extends what is possible in education and training, and it provides exciting new experiences that engage learners immediately, including:

- **remote participation** – field trips provide opportunities to broaden understanding and develop new skills. VR widens the possibilities, enabling exploration of places that would be difficult, dangerous or impossible to visit for a learner, such as the surface of Mars or the inside of a volcano
- **time machine** – trips through time are possible; students can walk with dinosaurs, engage with historic events or watch landscapes change over the centuries
- **simultaneous engagement with physical world** – augmented reality allows learners to interact with the world around them and with AR elements at the same time
- **remote presence** – people who cannot be together in the physical world can interact and work together in a VR environment, manipulating virtual objects and moving around the setting together.



In a virtual world, students can develop their understanding of structures such as aqueducts by working to recreate them.

These ways of engaging can support learners in understanding concepts, practising skills and performing tasks or procedures:

- **focused immersion** – educators can shape or modify a scenario, drawing attention to the aspects that are important or stripping away elements – for example, showing a human body and then the underlying skeleton or muscles
- **dive deeper for a more nuanced understanding of content** – learners have time to explore elements of an experience in detail and can re-run each one many times
- **virtual rehearsal** – in virtual reality, the same situation can be encountered multiple times so students can trial different approaches, perfecting an emergency response technique, practising a difficult procedure or coordinating teamwork
- **just-in-time support** – in an augmented or virtual environment, students can pull up information that is immediately relevant to what they are trying to do – for instance, a set of instructions on how to perform an unfamiliar procedure.

Making use of enriched reality

All over the world, enriched reality is being used to support learning. The following cases introduce some of the possibilities.

Clinical simulations enhanced with mobile mixed reality: Researchers in Auckland, New Zealand, gave student paramedics a 360° overview of a critical-care scenario using a VR headset and handheld controllers¹. The sights and sounds of the video helped to immerse them in the scenario. Students were provided with information and updates by radio and text, as in an emergency situation. They evaluated the scene in an authentic way before moving into a simulation suite to collect patient information and ‘treat’ a realistic mannequin.

Medical training: Enriched reality makes it possible to look inside the human body without making an incision. This is useful for medical training in equipment, techniques and procedures². Virtual reality can also be used to simulate patient interactions. Practising procedures in simulated environments is a low-risk way of developing skills. For example, students at the Beijing University of Chinese Medicine learn acupuncture with VR technology³.



A projection in Bath fills in missing elements of a ruined temple pediment.



A second projection adds detail and colour to the original ruined temple pediment.

Roman history: The Roman baths in the city of Bath, UK, enhance understanding of the historic site with enriched reality. Animated projections and soundtracks populate the site with ancient Roman visitors who move around the space, interact, bathe and chat. The fragmentary remains of the magnificent temple pediment are regularly enriched with projections that add missing sections and colours⁴.

Signing avatars: Learning sign language from videos and pictures is challenging, because two-dimensional representations cannot capture all aspects of communication. The SAIL project at Gallaudet University in Washington, DC, has developed a 3D learning environment. Signing avatars were created by using motion-capture recordings of deaf signers. Learners encounter these avatars in a VR environment accessed via head-mounted goggles. In this environment, their movements are captured via a gesture-tracking system. A teaching avatar guides learners through a lesson in which they observe and produce signs⁵.

Safety training for construction workers:

The most memorable form of safety training is experiencing or witnessing an accident. In the USA, the Center for Innovative Research in Cyberlearning (CIRCL) is developing VR training that makes this approach possible without harming students. The virtual experience is enhanced by 'haptic' technology that recreates feelings of touch and motion. Learners will be able to explore a hazardous virtual environment. If they don't avoid all the dangers, they will receive audio, visual and feel feedback that simulates what would happen if they made the same mistake at work⁶.

Teacher training: Kent State University in Ohio has been using 360° cameras to produce immersive videos of classrooms. These are used by teachers in training to create a shared experience that supports rich conversations about what is going on at different points in the room and in the lesson. The technology also makes it possible to compare and discuss the different aspects that trainees and experts focus on during the lesson⁷.



Virtual Skiddaw. The student must choose where to go to complete a set of tasks designed to develop their skills as a geologist.

Virtual field trips: Virtual Skiddaw recreates the sights and sounds of a mountain in the north of England. In this environment, science students at The Open University explore six sites. They browse map overlays, fly over the whole area or walk to visit sites for detailed observations of the geology. Students can view rocks at all scales, from a field sketch down to a slide under a microscope. Learning activities can include sketching rocks, describing hand specimens of rocks, contrasting texture and mineralogy of rock types and describing structural features⁸.

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enriched reality is at its best when it is used to create experiences that would not otherwise be possible

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Conclusions

A decade ago, universities and colleges around the world tried out virtual worlds. They often began by replicating their own setting or campus, which resulted in a diminished rather than an enriched reality. Instead of reproducing the constraints of the physical world, enriched reality is at its best when it is used to create experiences that would not otherwise be possible. Small-scale use of enriched reality is within reach for learners with access to a suitable smartphone and a good internet connection. VR headsets are coming down in price but are generally still not cheap, particularly if many are needed so that many students can use them at the same time without some risk to health through sharing. They also need to be stored safely, charged and updated occasionally. This means it is important to have clear reasons for investing in them so that they remain useful tools when the excitement of using new technology has worn off.

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Gratitude as a pedagogy

Reflecting on attitude to improve wellbeing and learning

Potential impact: [High](#)

Introduction

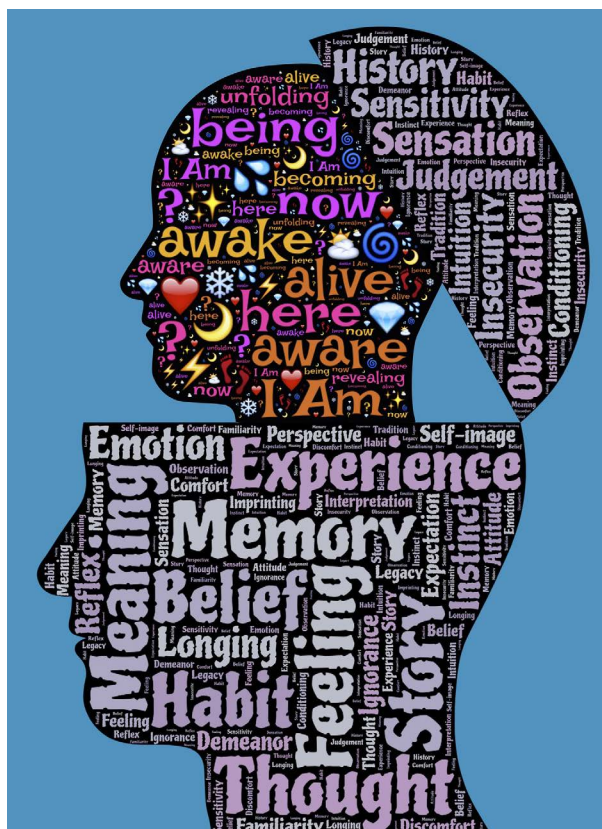
Gratitude, when considered as a pedagogy and not as an emotion, is an approach to learning and teaching that actively involves the acknowledgement of what we have or receive and the conscious action of wanting to give back in some way¹.

Gratitude is typically expressed towards someone or for something. When applied in an academic context, it can help students to improve student–teacher and student–student relationships, it can help them to be more aware of their learning environment and it can increase their understanding and focus on their studies. Research among college students found that practising gratitude within learning indicated an increase in students' ability to focus in class and to remain resilient while facing difficulties in learning².

Applying gratitude as a pedagogy in the classroom can also improve the mental health and wellbeing of students and teachers. For example, a study of university teachers found that practising gratitude as an approach in the classroom led to teachers being better able to deal with stress and find calmness, and it enhanced their wellbeing³. It is possible that this approach to teaching and learning could be even more relevant in times of adversity as we are still grappling with the impact of Covid-19 on students' learning and on students' and teachers' wellbeing and mental health.

Putting it into practice

One practical approach to implementing gratitude in learning and teaching involves creating a 'state of preparedness'⁴ where teachers and students are asked to prepare and examine their attitude before starting their learning and during learning activities. This state helps individuals to become aware of the kind of attitude that they hold (negative or



Encouraging self-awareness and reflection on learning can improve students' experience and appreciation for learning.

positive) and the impact this might have on their learning, and on teaching in the case of teachers. By creating a state of preparedness before and during learning activities, students and educators can be encouraged to be more aware of the learning taking place and those involved in the process.

This state can be developed when students and teachers are asked to reflect on a particular learning topic or activity using the following elements: thoughts, words, emotions, self-talk and physical state. They are also prompted to use two different angles: first to look at these elements from the opposite of gratitude, which is often complaint, dissatisfaction and entitlement; and then to look at the elements again from

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students reported an increase in ability to focus in class and to remain resilient while facing difficulties in learning ”

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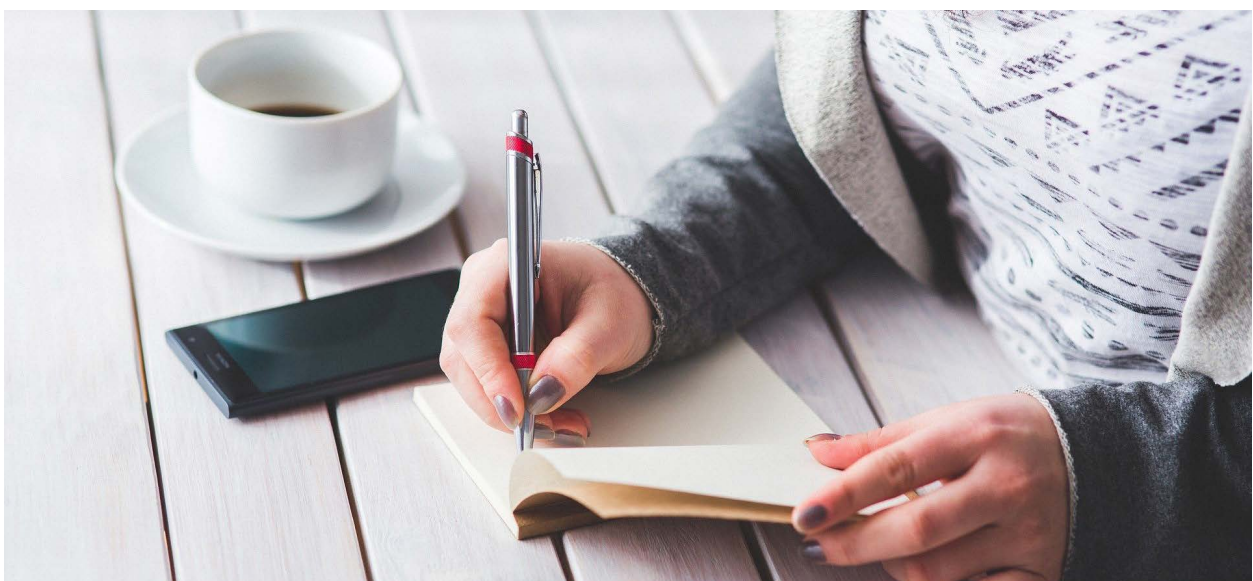
a gratitude point of view. While reflecting, students are asked to take notes or complete a template. This reflection has the potential to bring awareness of predetermined negative attitudes and behaviours towards certain topics or learning activities. The negative attitudes are then analysed and replaced by elements of gratitude, bringing a state of awareness, presence and appreciation among students and teachers. Students who have engaged in this approach have reported being more focused and less distracted, having great motivation for learning, increased confidence and a deeper understanding of concepts⁴.

Gratitude can also be applied as an assessment task. An Australian study was conducted to enhance the teaching of literacy with pre-service teachers, in ways that valued their relationships with secondary students they were teaching, using notes of gratitude. Teachers asked students to write or draw a gratitude note about a topic or learning activity being assessed. Students were prompted to reflect on the content explored, how much

they thought they learned, the improvement in their relationship with secondary school students, what they were grateful for and strategies of how they could give back to others, including to their professions once they graduated⁵. This approach has the potential to improve the teacher–student relationship, appreciation of the learning taking place and future applications of the learning.

When integrated into teaching processes, gratitude can support focus and resilience in learning. A group of 50 US college students were asked to self-reflect on their learning experiences and consider gratitude over three months. Students were sent periodic text reminders three times a week asking them to take time to reflect on their class (prior to learning), and learning practices (at the end of each week), and to think about their educators (in the middle of each week). Participants were invited to either carry out the practice informally or through writing in a journal. These students reported an increase in ability to focus in class and remain resilient while facing difficulties in learning².

Developing a gratitude journal can also help students and teachers to enhance learning and teaching, respectively. After the end of the day or week, teachers can ask students to write in their personal journal three good things related to their learning. Teachers could use the journal in a similar way and take note of three things that happened in their teaching



Writing a gratitude journal can be beneficial to both teachers and students.

during the day or week that they are grateful for. Dedicating time for the gratitude journal activity is important, as teaching schedules can be tight. This way, students and teachers would value the time and the opportunity to appreciate what was learned and taught and the people involved in the process³.

Challenges

Implementing gratitude in learning and teaching can be challenging. Here are some key challenges teachers and other practitioners might face when practising gratitude as identified by Howells¹:

- **systemic** – when practitioners' priorities and pressures are to focus on administrative and process-based tasks, leaving very little time to spend on their own professional development and on innovation in teaching
- **conceptual** – when practitioners see gratitude as a practice that depends on their state or mood. It is important (but hard) to think about gratitude even when things don't go as planned – for example, in times of adversity. This should not distort the situation but should build resilience
- **reciprocity** – this refers to a teacher's lack of motivation to apply gratitude when students or colleagues are not able to give back. While practising gratitude should mean that there is no expectation of getting anything back in return, this can be difficult to achieve or maintain.

Gratitude, and how it is expressed, might be influenced by cultural and social values, which suggests that gratitude as a pedagogy might be adopted more or less readily in different countries or settings.

Conclusions

Gratitude as a pedagogy brings benefits to students and teachers. It can increase engagement, connectedness, focus and understanding of concepts being learned. It can improve the relationship between teachers and students, increase appreciation of what is being learned, and what and who is involved in the learning process, including people and content. Gratitude as a pedagogy can create a state of preparedness and awareness about learning inside and outside the classroom, including online environments. By expressing gratitude towards someone or something, students and teachers can enhance wellbeing and calm amidst stress.

Gratitude in education has also been used to increase inclusion and diversity in teaching and learning, to improve PhD student–supervisor and mentor–mentee relationships, and to build resilience, confidence and performance of elite athletes. It has been increasingly included in the professional development of school teachers, used in early-childhood education and explored as an additional support for cancer patients. As wellbeing and mental health are considered broadly within education, it is a pedagogy that might be highly relevant in the present and near future. Its applications are wide and varied and the results can be powerful.

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Using chatbots in learning

Using educational dialogues to improve learning efficiency

Potential impact: [High](#)

Introduction

Chatbots are part of a growing range of tools based on artificial intelligence (AI). They can answer a human's questions, ask questions, guide and assist in problem solving. This means that when a teacher is not available or cannot help, learners are still able to make some progress with their learning.

Chatbots are developed using human dialogue analysis or human behaviour recognition. In the former, patterns are extracted from natural human language or conversation. For example, when in a conversation Tom asks Mei, 'Which course do you suggest I take if I want to learn about artificial intelligence?' Mei would understand Tom's intention and might reply, 'Learning about artificial intelligence requires some knowledge of mathematics and programming. If you have no related experience and just want to find out about this subject, I suggest you take course A. If you already have some relevant knowledge, course B would be helpful.'

Dialogue patterns can be established by analysing a large number of dialogues. Chatbots are then able to use these analyses to answer questions or support humans in problem solving, either verbally or via text. Chatbots that help with problem solving are also based on an understanding of human behaviour. If a person has tried something several times, they may need help, in which case a chatbot could appear (in an online environment) and act as a facilitator. Dialogues with the learner can be text based, voice based or video based.

In the past, most chatbots have been based on simple sets of rules that determine how to respond to users, but increasingly they use AI techniques which make it possible to understand people's natural languages, voice, body language and behaviours, and to make sense of patterns that exist in languages or

behaviours. Using AI techniques, a chatbot can conduct a dialogue with a user or analyse relevant data and come up with suggestions or solutions. Chatbots are now commonly used in commerce, industry, healthcare and smart homes – for example, in customer service scenarios. In recent years, thanks to new research findings on how people learn and how to promote learning, chatbots have been tried out in education with a growing expectation of 'intelligent' learning and teaching. Compared to traditional learning and teaching, chatbots bring new opportunities, such as immediate problem diagnosis and interventions which make the learners feel they are not alone during the learning process. Learners might also be more relaxed and express themselves more freely as they are not interacting with humans who might judge them. This relaxed environment can be conducive to promoting learning.

Potential and benefits of chatbots in learning

Chatbots can be used in formal as well as informal learning environments and can provide learners with support tailored to their needs, such as constructing an immersive learning environment for learners, analysing learners' requirements and initiating supportive conversation. They can conduct their analysis in the background without disturbing learners and can provide appropriate support.



chatbots bring new opportunities, such as immediate problem diagnosis and interventions which make the learners feel they are not alone during the learning process



In educational practice, researchers from Georgia Institute of Technology have investigated how chatbots can be used in online classes. They developed an AI teaching assistant called 'Jill Watson' based on dialogues and learning data from previous courses. With these data, Jill could analyse learners' questions and come up with immediate responses. The chatbot has been used on several courses to help learners with content-related questions and through meaningful dialogues. Researchers found that learners could not distinguish the chatbot from the teacher, which suggests that in some contexts chatbots could work well as online learning facilitators.

Researchers from the Advanced Innovation Center for Future Education (AICFE) at Beijing Normal University have investigated the role of a chatbot in moral education. In moral education, teachers focus on helping learners understand moral problems and cultivate morality. In this research, an AI-bot (AI-powered chatbot) was developed to detect learners' moral problems via dialogues and provide learners with adaptive solutions. For example, when the learner expressed negative emotions, the AI-bot would diagnose the cause by chatting. After that the AI-bot would assess whether the learner had experienced unfair treatment. Then it would suggest some options and give examples of how to deal with their issue. The results showed that the AI-bot could mimic teachers with 8–9 years' experience.

In the field of language learning, chatbots can be used for informal conversation and pronunciation practice, which some learners prefer as it enables them to try out different ways of saying something and to avoid feelings of embarrassment when speaking in a foreign language. Researchers¹ have also used chatbots in education to support collaboration. They designed and trialled a game-based collaborative problem-solving ability assessment tool, 'Circuit Runner', which demonstrated the potential of chatbots in assessing higher-level skills in education. Finally, researchers have shown that chatbots can also be creative. For example,

a chatbot has been developed which could help generate high-quality quizzes based on existing materials².

How to use chatbots to promote learning

The first aspect to be considered is the learning scenario and identifying the role of chatbots within it, such as dialogue facilitator, learning problem analyser or guidance provider. Secondly, we should determine when the chatbots should be involved during the learning process. This should be based on the designers' understanding of learning and teaching processes, and specifying learners' and teachers' requirements in different scenarios is important here. For example, it could be decided that a chatbot should not appear when the learner is just starting an inquiry; when the learner encounters difficulties, a chatbot should then act as a guide or facilitator. After the learning has taken place, an assessment mechanism could be provided so that the chatbot can evaluate the learner's achievement. Lastly, data about the learner's performance can be shown to the teacher for a new round of decision making and improvement in learning.

Challenges and emerging opportunities

Researchers investigating the role of chatbots in real learning contexts acknowledge that the application of chatbots is still at a very early stage. Chatbots cannot work effectively without understanding human learning mechanisms. To bridge the gap between the techniques behind the chatbots and human learning mechanisms, learning design is necessary. Learning design involves specifying the context, determining learning objectives, preparing content, choosing teaching and learning strategies, and evaluation. Most learning designs could be enhanced with more detailed information about learners and knowledge of learning or teaching. AI techniques have created chatbots with the capacity to collect information and explore learners' requirements before providing the learners with smart learning environments and adaptive supports.

However, chatbots still depend on specified rules or learner models (representations of how learners behave) and may not meet learners' demands if learners are not tolerant of the shortcomings of chatbots, such as their limited capacity to handle misunderstandings and breakdowns in a conversation. Further and deeper inquiry into how people learn will support the design of more intelligent chatbots. Privacy issues such as who owns and has access to conversations between chatbots and humans will also need to be addressed. Learners may perceive such conversations to be entirely private, but it should be made clear to them who else has access or has rights to access their conversations and other data (for example, these might be system developers or teachers).

Nevertheless, chatbots have also brought us opportunities, especially when tackling the contradiction between large scale and high quality in learning. A burgeoning world population is making personal tutoring more difficult to achieve while at the same time teaching bigger class numbers is less effective.

The emergence of chatbots makes it possible to achieve greater personalisation by collecting data about learning dialogues, and learners' behaviours and contexts

before working out their needs and providing adaptive support. Furthermore, this will help reduce educators' workloads. A focus on learners' needs could also make the learners feel they are being noticed by instructors or course managers, which will improve their motivation. Chatbots could be a new way to achieve learner-centred instruction.

Conclusion and future trends

From research studies, we can see that chatbots have been used in different contexts to solve educational problems. The studies provide evidence that chatbots could help realise more adaptive and smart learning.

In the future, chatbots could be used to analyse learners' needs, provide simulations and semi-structured guidance, and conduct process-oriented evaluation. They could be used to help diagnose disabilities and provide teachers with suggestions for how to support learners. A conversation with a chatbot can give learners the opportunity to let their teacher know that they have a disability such as dyslexia. A more advanced chatbot might also identify some conditions from how a person communicates. If the research moves towards representing learners' characteristics and learning processes better, chatbots could play a more important role alongside teachers.

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Equity-oriented pedagogy

Finding fairer ways to improve learning for all

Potential impact: **High**

Introduction

Innovative approaches to give every student the opportunity to achieve fair and comparable outcomes have been a growing trend. This has developed because persistent and substantial gaps are being found in the likelihood of educational success linked to characteristics such as particular forms of disability or ethnicity. Governments and educational institutions are making it their goal to reduce or remove these gaps. However, developing educational opportunities that are inclusive of all students requires thinking about the learning journey from multiple perspectives. There is a need to ensure equality in the opportunities to access education, but also a need to focus on how pedagogy can lead towards fairness and impartiality ('equity') in the teaching and the outcomes.

Concepts and frameworks such as Universal Design for Learning (UDL) guide educators and policy makers to make education accessible for all students. A broad conclusion from these efforts is that 'one size doesn't fit all'. In key areas of education such as course design, content creation, assessment and the use of technology, there are societal and structural challenges to inclusion that cannot be resolved by equality of access alone. Therefore, there has been a growing trend towards pedagogical innovations that aim to create equity, where each student can achieve comparable positive outcomes regardless of their background.

Putting equity into practice

We can improve and critique how equity is impacted by many aspects of teaching and learning. The following four areas are useful starting points for putting equity into practice.

Listening and adapting teaching to students

Teachers tend to embody their own backgrounds and cultural expectations in their teaching, but this may not be a good match for their students. One way of tackling this is to listen to students in meaningful and systematic ways and make adaptations to ensure that their voice and lived experience are embedded in their learning experiences. This includes ensuring that students are given opportunities to develop the skills they need to have for the summative assessments that are often most important for their final grades. It also asks teachers and content producers to consider aspects such as the use of language and cultural references in their teaching materials, so that they are accessible to diverse groups of students.

One study evaluated the adoption of an 'adaptive equity-oriented pedagogy', in which the curriculum and teaching strategy were adapted rapidly according to class discussions and data collected from students. Surveys about the course material, formative tests and anonymous feedback forms were used on a weekly basis to guide the teaching provided rapidly at individual and course levels. This was found to result in higher attainment in final assessments when compared to a control group where the teaching approach was fixed. Higher attainment was consistent across characteristics of disability, gender or immigration status¹, suggesting a level of equity was achieved. In another example, mathematics teachers were encouraged to use 'getting to know you' and 'shadow a student' activities, which included understanding students' lives at home and in their community, to better appreciate how knowledge of their backgrounds could be used in teaching².

Recognising uneven effects of educational technology

Educational technology can enhance learning opportunities for students but can also widen divides if not used carefully and critically. Making online learning materials and applications free can help as a starting point to widen access but does not benefit all students equally: wealthier and better educated families can benefit disproportionately from the same initiatives.



Educational technology can enhance learning opportunities for students but can also widen divides if not used carefully and critically



Open textbooks provide free online versions of introductory college and university textbooks, which are otherwise highly priced and place a substantial financial burden on low-income students. These open textbooks provide greater access to learning materials. However, accessing free online materials still requires a student to have access to a network-enabled device like a laptop, tablet or smartphone, and to be able to access a reliable and affordable internet connection. When students do not have such access, this 'digital divide' can be compounded by the societal and cultural context in which learning takes place. Students who are not encouraged to learn at home, or are actively dissuaded from learning by friends or family, may not pick up resources even when they are available. This is a less obvious but equally important set of barriers that educators should consider.

Teaching approaches can also make technology-enhanced learning more or less effective, with the risk that poorer, under-resourced schools are less likely to try more creative uses of technologies and instead may focus on more limited, basic skills building.

The programming language Scratch has been designed to overcome this challenge. Scratch has been adopted enthusiastically by schools teaching disadvantaged as well as well-supported school students. There have been efforts to build 'entry points' into Scratch that target audiences which are under-represented in computing, and partnerships have developed with libraries and community organisations to overcome financial and cultural barriers in home-based access to learning technologies³.

When designing or utilising technology-enhanced learning, steps should be taken to consider barriers and support the equal participation of marginalised groups, taking into account challenges both inside and beyond the classroom. Equitable approaches should seek to engage not only students but also their parents and mentors, reaching out to the wider community and building digital capacities across neighbourhoods as well as in classrooms.

Drawing upon pedagogical frameworks to support equity

Pedagogical practices and frameworks should be drawn upon to encourage equity. One of the most established approaches is Universal Design for Learning (UDL). This seeks to accommodate individual learning differences and is based on three principles of curriculum design:

- multiple means of engagement (for example, supporting learners to be motivated by creating and embedding personally meaningful goals in their learning)
- multiple means of representation (for example, considering if learners who have a different first language to the teacher would benefit from alternative materials or transcripts for videos)
- multiple means of action and expression (for example, providing alternatives to tasks that require navigation of a physical environment which may not be fully accessible).

The UDL guidelines were primarily devised to support students with disabilities but have wider potential to support equity. While there remains a lack of studies that evaluate the efficacy of UDL, case studies offer insights into how it can engage students and educators across various disciplines.

Recognising how assessment practices can be unfair

Discussions of equity often focus on educational outcomes, and the identification of gaps in attainment for specific groups is an important driver for equity-oriented pedagogy⁴. Given the prevalence of such gaps, practices around assessment need special consideration. Embedding choices with respect to assessments, or even the co-creation with students of their assessments, can help to reduce barriers. Areas where the form or content of assessments assume the cultural norms and knowledge of dominant groups should be recognised and tackled⁵.

Formative assessments during a course can enhance fairness by allowing all students to develop their understanding of how assessment works in advance of summative (final) evaluations. They can also draw on personal experiences as a starting point to develop this understanding. One example describes an activity where students are invited to discuss the genetic characteristics that they and their relatives have inherited.⁶ This type of approach highlights and answers questions that arise from the students from an early stage in the course, developing greater comfort and understanding in answering questions on a subject in the lead-up to summative assessments.



Teachers tend to embody their own backgrounds and cultural expectations in their teaching, but this may not be a good match for their students



Benefits and challenges

By putting the focus on fairness rather than simply on whether access is possible, equity-oriented pedagogies offer a more holistic approach when considering inclusion. But fairness requires consideration of barriers at many levels – from the personal to cultural and societal. It could create additional workload and require change to institutional procedures (for example, to co-create an assessment with students rather than set this in advance of course start). While the uneven effects of digital exclusion and digital poverty must be considered, new technologies and increased online and hybrid learning also provide opportunities for increasing personalisation and co-creation of learning. However, there is a concern that where the focus is on developing individualised support for learners, this should not reduce the social benefits of learning together or unintentionally create new barriers. Ways to enhance equity need to be considered alongside the basic ability to access education, and both are key concepts in developing educational strategies and pedagogies that improve fairness in society.

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Hip-hop based education

Culturally relevant learning through hip-hop

Potential impact: [Medium](#)

Background

Hip-hop based education (or HHBE) is an approach to teaching and learning that focuses on the use of hip-hop, both inside and outside a traditional school setting¹. Hip-hop, as a musical genre, culture and art movement has been argued to have become relevant to education in three ways. Firstly, teachers and educators are using aspects such as rap-music texts in curricula. This tends to be used as a way to provide a culturally appropriate and critical approach to their teaching in the hope of empowering marginalised groups², such as young offenders or looked-after children. Secondly, hip-hop is more than a musical genre – the messages constructed in the music are interwoven into the process of identity formation and cultural understanding for many people². Thirdly, higher-education institutions globally are engaging with hip-hop through research, taught courses and conferences². In many colleges and universities, such as Stanford and the University of Michigan in the USA, various forms of hip-hop are studied within different subject disciplines such as English, sociology, linguistics, dance, anthropology and music³.

Hip-hop based education is an umbrella phrase, which covers educational research that uses the elements of hip-hop (for example, rap music, graffiti or breakdancing) to inform curricula and teaching in formal and non-formal spaces such as schools and community practices⁴. As a pedagogical approach, HHBE involves the use of hip-hop music, art and culture to create philosophies and approaches to teaching¹. [Hiphoped.com](#) is an example of the rise in the approach. Individuals, such as educators and students, have come together to form a collective group that strives to disrupt hierarchies that still exist



An example of hip-hop art featuring coloured graffiti.

in many schooling systems. #HipHopEd is a weekly professional development Twitter chat where educators come together to discuss the hip-hop approach to education. They also hold an annual conference.

Examples from practice

Some scholars⁵ have found it useful to view HHBE as a coming together of four areas:

1. **hip-hop education programmes** which may include a series of after-school clubs or holiday camps, or as part of a community-centre programme

2. **national hip-hop education campaigns** which may be supported by charities, public figures or high-profile celebrities
3. **hip-hop educational products** such as study guides, books and online programmes
4. **not-for-profit organisations** which partner with schools to distribute educational programmes or work with teachers and schools to develop learning materials.

HHBE can be deployed at a local (school, centre) or even individual class level. This has been illustrated in contexts such as early-childhood education. For instance, hip-hop has been used in the educational curriculum in the USA for pre-schoolers and reports demonstrate that the approach benefited children's social and emotional learning, language, literacy, and cognitive and physical development⁶. As such, the approach has practical applications from early years learning right through to higher-education levels of study.

Some examples of practical applications of HHBE are using rap lyrics as text in lessons such as English or using elements such as

DJing (performing as a disc jockey) or MCing (acting as a master of ceremonies who is the host of a staged event or performance – commonly referred to as a rapper or rap artist) as a way to describe or explain content, develop classroom activities and create methods for empowering youth¹.

In another study, it was found that implementing HHBE into a science programme created an avenue for teachers to develop an understanding of students' social experiences and emotions⁷. The authors argued that reflecting on and sharing mental-health concerns is an under-focused dimension of teaching and learning that has the potential to impact students' academic achievement positively in science, technology, engineering and mathematics (STEM) disciplines⁷. Therefore, HHBE can support student engagement and motivation in their learning.

In the UK, HHBE has been used in workshops with students from South Asian communities to facilitate learning by critically engaging with rap videos and artefacts to inspire their own performances of a rap (a form of music) or spoken word⁸.



A young woman doing a breakdancing move.

In hip-hop courses in the USA, teachers learn how to tap into the richness of hip-hop cultures to engage students in topics that range from Shakespeare to neuroscience⁹. A key aspect to consider and reflect on is that the approach needs to be an authentic learning experience. This means being open about your own background and experiences, and keeping clear of gimmicky hip-hop instructional strategies such as implementing hip-hop terminology out of context or showing a rap video that has nothing to do with the course subject⁹. This is particularly important when considering student-centred teaching and approaches that focus on the relationship between people and power. For example, as well as incorporating elements of hip-hop into teaching and learning, it is important that teachers involve students in critically examining the negative aspects of hip-hop that reinforce or encourage sexism, violence, anti-blackness or other forms of antisocial behaviour¹⁰.



teachers learn how to tap into the richness of hip-hop cultures to engage students in topics that range from Shakespeare to neuroscience



Barriers and challenges

Challenges involved with implementing this teaching and learning approach are that teachers may not have experience or in-depth knowledge of hip-hop and therefore may find it difficult to explore this topic with their students. On the other hand, one study found that students appreciated the teachers' acknowledgement of a lack of hip-hop experience and their ability to prioritise students' perspectives and voices over their own¹¹. Furthermore, teachers developed cross-cultural competence to better understand their students¹¹. If a teacher or instructor lacks (and can acknowledge their lack of) experience, then both students and teachers can explore and enhance their understanding collaboratively.

Gosa and Fields (2012)⁵ urge educators who are considering the potential pitfalls and limitations of this approach to self-reflect about the following seven areas:

1. **reflection of expertise** – 'What experiences or qualifications do I have that enable me to use hip-hop in my teaching?'
2. **hip-hop as (mis)appropriation** – 'What is my connection or relationship to hip-hop? Am I celebrating my culture or am I using another culture simply for my own benefit?'
3. **HHBE for enabling success** – 'Will my use of hip-hop help students succeed in the future?'
4. **interpretation of hip-hop culture** – 'Which aspects of hip-hop will be presented in my teaching?'
5. **synthesising youth identity** – 'Will my use of hip-hop place limits on or extend understanding of youth culture?'
6. **issues of celebrity culture** – 'What place do certain "bodies" have in empowering my teaching or topics I teach?'
7. **being realistic about hip-hop in schools** – 'Am I being critically reflective about my goals and the limitations of hip-hop in the curriculum?'

These seven areas of reflective inquiry could be used by teachers and educators to reflect critically on their own teaching, the content of their classes and the impact on students' learning experiences.

Conclusion

The application of HHBE into curriculum and pedagogical practices has practical applications for the classroom. It involves the exploration of hip-hop elements such as rap lyrics, breakdancing and MCing within curricula and as pedagogical resources. It has been shown to bring benefits in terms of critical thinking, teacher and student relationships and cultural appropriateness. However, it requires critical reflection within the context (e.g. the school, programme or course) and by teachers to ensure that both they and their students maintain an authentic learning experience and a critical perspective.

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Resources

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Student co-created teaching and learning

Teachers and students creating materials and curricula

Potential impact: **Medium–High**

Background

Student engagement in teaching and learning can range from low (e.g. attendance at lectures) to high (e.g. a student exceeding the requirements of the course). Engagement can also be gauged by how much students are represented in their institution and their influence on policy and governance. Having students work as partners in the educational experience enables their engagement at a much deeper level, as they are more involved and have greater agency through co-creation of curricula and materials alongside their teachers. The co-creation of teaching and learning is a relatively recent innovation that can lead to greater empowerment of students and better relationships between teachers and students, and also between students themselves.

There are four main modes of student engagement:

- **representative** – this is usually a volunteer role, or elected role, where an individual or small number of students represent(s) a larger body of students in an official capacity, e.g. a faculty committee or institutional working group
- **consultant** – where a student is paid money to work on a particular project, and is usually selected for this task by staff
- **co-researcher** – where a student works with a teacher doing research that is related to a subject or to teaching and learning
- **pedagogical co-designer** – where students share responsibility with teachers for designing teaching and learning activities and assessments.

We focus here on the last role, namely pedagogical co-designer. This is when students can work alongside teachers, learning designers and developers to create new teaching and learning experiences or amend



A student and a teacher jointly designing an assessment task for a course.

existing ones, sometimes based on student feedback. Depending on the situation, students can have higher or lower levels of participation in this process, captured neatly in the ‘ladder of participation in curriculum design’¹, with tutors in control at one end and students in control at the other. In practice, much co-design – or co-creation – tends to occur in the middle of this spectrum, where students have some control. As students participate in co-creation activities, they negotiate with others (teachers, other staff, their peers) and form and evolve their identities. All members share the resources available and they also share goals for teaching and learning.

In this respect, the theoretical background here is best explained by Etienne and Beverly Wenger-Trayner’s work on ‘communities of practice’², where a group of people come together, linked by a common interest, and meet regularly in order to find ways of improving their practice. They form an identity defined by the shared interest and commitment to a topic or activity. The community is central to this work and is established through relationship building

and regular interactions with other members. Sharing stories of case studies, best practices, and what works or does not work, results in an effective form of knowledge exchange that happens during these sustained interactions, building up a valuable repertoire of shared practice. Students and teachers working in such a community can experience more of a peer-based working relationship, and it can lead to greater empowerment of students, reducing hierarchy between teachers and students.

Examples from practice

There is a growing body of case studies that give examples of successful student co-creation in different parts of the world.

At The Open University (UK), there is an institution-wide Curriculum Design Student Panel that aims to involve students in both planned and ad hoc ways to inform the early development of learning activities, materials and tools. Co-creation and co-design use this student voice to assist staff with evidence-based decision making and the production of engaging learning and teaching experiences across all faculties. Originally established in 2016, the panel currently has around 2000 students participating in various projects. These include regular small group activities – often relating to specific courses – and larger-scale, more general ones such as contributions to surveys, interviews, consultations, user testing, developmental testing, workshops and critical reading/feedback of course content and activities. Student participation in the panel is mostly run online but occasionally there are face-to-face activities.

As part of the University of Edinburgh–EUSA Gender Initiative, staff and students were engaged in course co-creation that considered matters of gender³. Students who participated in the project reported feelings of positivity, enthusiasm and of really making a difference to others, rather than creating written coursework merely for assessment. However, frustrations were felt in terms of how the project was received, and indeed how the students' voices were heard, especially when they were challenged by stakeholder relationships that were both vertical and

horizontal across the university. A number of other student co-creation projects are also showcased on the website detailing the initiative³.

In the USA, one academic, Robin DeRosa at Plymouth State University, launched an 'open textbook' project that was run over the summer⁴. In that project, she and some students – paid by DeRosa herself – created



these excited and enthusiastic students really cared about the course, owing to their shared ownership and curation of the core course textbook



an open textbook formed from existing online texts that were freely available. The construction of this anthology was intended to save students the cost of having to keep buying updated textbooks in support of their studies. In addition to sourcing the texts, students also created introductions to them, as well as short films, discussions and even assignments. The addition of a note-taking app meant that students could make and share comments about each textbook, leading to highly engaging social online interactions. This work, initially imagined as a money-saving venture, led to a much higher social and academic investment in the associated course by those students. These excited and enthusiastic students really cared about the course, owing to their shared ownership and curation of the core course textbook.

Barriers and challenges

Engaging students more deeply in the teaching and learning process is clearly advantageous for a number of reasons, but it is not without cost. Students may need to have particular skills or expertise in order to engage fully, and they may not possess these, or claim that they do only for the co-creation team to find out that they are not as well developed as is required. Their involvement may alter the direction of content creation from what was originally planned,

which could lead to issues relating to time and cost. Some teachers may show resistance to this approach and may feel threatened or consider that students do not have the required aptitude to co-create teaching and learning. Also, whilst student engagement may be very high, participation is likely to be only for the small number that are chosen – or are able – to engage. The process may further exclude those who already feel excluded, reducing their agency even further. In other words, those who benefit may be those who are already very engaged, and it is likely that whole classes, or cohorts, of learners are unable to be involved in quite the same way.

Care also needs to be taken when looking at claims of ‘wide-scale’ co-created projects⁶, as these typically serve a small number of students (fewer than 100) when considered as an overall total of those who could benefit. In other words, when there are often several projects running, each with a small number of student participants, the overall total number used promotes this work in a somewhat exaggerated manner. However, when carried out across several instances in one institution, there is the capacity-building aspect of this work to consider which can set in motion greater awareness and involvement from other staff in championing this idea.

Conclusion

Co-created teaching and learning increase engagement as learners participate in these activities. Such participation and engagement can facilitate the construction of learner identity. Learners build their community membership and develop their relationships with both teachers and peers in the process of discussing and negotiating meaning (disciplinary knowledge, theories, etc.) and how this meaning develops through participation in communities of practice. In such communities, teachers and students share resources, goals, interests and practices. However, this pedagogy has its challenges in terms of increased commitment required by students, resource overheads for content production teams, teachers’ reluctance to employ this method, and the limited number of students who actually benefit from this method. These factors need to be taken into consideration for further improvement and effective use of this approach.

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Resources

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- Bournemouth University website suggesting several widely available tools that can be used for collaborative and co-created activities:
<https://www.bournemouth.ac.uk/about/our-people/centre-fusion-learning-innovation-excellence/tel-toolkit/pedagogical-approaches-tel-collaboration-co-creation> (Accessed: 14/11/20).
- Case studies from academics and professional services, resources and further links, and co-creation principles formed at De Montfort University by staff and students:
<https://www.dmu.ac.uk/current-students/student-experience/co-creation/co-creation-at-dmu.aspx> (Accessed: 14/11/20).

Telecollaboration for language learning

Using communication tools for collaborative language learning

Potential impact: [Medium–High](#)

Introduction

Learning a new language is an exciting and rewarding experience for many learners. However, learners sometimes struggle to keep going and have difficulty learning to speak and communicate in a new language appropriately without authentic interaction with native or fluent speakers. Thanks to widely available, free-to-use online communication tools like Zoom, WhatsApp, Facebook, Line and WeChat, there are new opportunities for authentic language learning called ‘telecollaboration’. Telecollaboration involves language learners studying in collaboration with other learners in geographically distant locations through such online communication tools. Half of the learners’ communication will be in one language and half in the other, and they will take turns to play the role of a tutor or a learner respectively.

Telecollaboration (also termed ‘virtual exchange’ or ‘online intercultural exchange’), as a pedagogical approach typically engages learners in online intercultural collaboration ‘projects’ with learners from other cultures. This approach can suit learners at different stages of their second language (L2) proficiency. Often these projects are formally supported under the guidance of teachers or trained facilitators within educational institutions, but there can also be less formal collaborations between two language learners from different cultures who meet up on Facebook or WeChat to learn each other’s language. Typically, in a telecollaboration project each learner has a personal goal. For example:

- in a formal education context, student Juan, from Spain, who is keen to learn German to improve his chances of gaining work experience in Germany, could enrol in a telecollaboration project within a German university programme, where there are students who want to learn Spanish before starting their apprenticeship in Barcelona

- in an informal learning context, Maria, who is based in the UK and is eager to learn Mandarin before travelling in China, could meet up and collaborate on WeChat with Chinese student Yue, whose goal is to learn English so as to be able to act as a tourist guide.

The two basic principles guiding telecollaboration for such language-learning opportunities are **reciprocity** and **autonomy**.

- **Reciprocity** means that, as far as possible, half the communication should be in one language and the other half in another language.
- **Autonomy** suggests that learners should act both as a tutor in their own language and a learner in the second language when engaged in telecollaboration, and they should make full use of the second-language learning opportunities.

Benefits

Different kinds of favourable outcomes of telecollaboration have been documented. Owing to the potential for feedback from peer learners (e.g. each participant supports and corrects the other person), researchers have examined the extent to which this practice has influenced second-language development. Some studies have found positive outcomes of telecollaboration compared to a control group¹ while many other studies have concentrated on virtual interaction and how feedback from first-language speakers improved the learning process². Telecollaboration has been found to improve L2 learners’ oral communication skills, to expand their vocabulary and grammar knowledge, and to help them use the second language accurately and appropriately in various situations. Telecollaboration has also helped participants to become more independent learners.



telecollaboration can enrich L2 learners' cross-cultural knowledge and raise their awareness of cross-cultural differences



While many forms of remote collaboration between learners from different cultures have existed for decades, such as pen pals and, more recently, contributions to discussion forums on the internet, today there are new opportunities to interact and receive feedback in a variety of ways. For example, in Zoom or other video communication platforms, language learners can practise their pronunciation and oral communication skills in their second language with telecollaborators who are able to give real-time support and feedback. Furthermore, by hearing and participating in conversations with native or fluent speakers, L2 learners can immerse themselves in a second language without having to visit another country.

As telecollaboration is based upon reciprocity, the novice English learner Yue becomes the expert in Mandarin, while the novice Mandarin learner Maria becomes the expert in English. This arrangement provides a safe space for both to practise a new language with the other, free from concerns about being judged by a teacher or other students.

Telecollaboration can contribute to building up a student-centred learning environment characterised by peer teaching, autonomous learning and individualised learning based on learners' personal interests and needs. Moreover, telecollaboration can enrich L2 learners' cross-cultural knowledge and raise their awareness of cross-cultural differences. This helps them to appreciate different cultures and develop their spoken and written communication skills.

Tasks and technologies

When participating in telecollaboration, learners tend to engage in three main learning tasks³: information exchange, comparison and analysis, and collaborative tasks. These tasks enable negotiation of meaning and offer opportunities for language and cultural learning.

Information-exchange tasks usually serve as an opening activity, involving learners introducing themselves, their families, their schools or workplaces, their home towns, etc., and helping to build up a personal relationship. Going beyond information exchange, comparison and analysis tasks engage learners in comparing and commenting on elements from both cultures, such as books, advertisements, TV programmes, movies or surveys. Through mutual support, learners will be able to explain similarities and differences revealed in the elements discussed. In collaborative tasks, learners work together to come up with a joint product or conclusion – for example, co-producing a translation, co-presenting a project or co-designing a website.

Several types of technology can be used in telecollaboration: asynchronous text-based communication, videoconferencing, social media and virtual worlds. Asynchronous communication tools such as emails and online discussion forums continue to be popular in telecollaborative exchanges. Successful telecollaborative projects tend to employ several different types of communication tool, making the best use of their individual advantages in order to achieve the specific goals of telecollaboration.

Procedures and resources

To carry out a telecollaborative project with students, teachers can follow these main steps. First, set up telecollaborative learning pairs with learners from two different countries or regions, preferably based on the students' level of L2 proficiency and common interests, and decide on appropriate technological communication tools. Second, design the project schedule and telecollaborative tasks. Third, train learners in telecollaboration rules: reciprocity and autonomy, and corrective feedback strategies (i.e. how best to correct the other person). Fourth, collect learners' synchronous and asynchronous communication records for follow-up tuition or task improvement.

Various online resources exist to help teachers at different levels to implement telecollaborative projects. For example, UNICollaboration has provided a platform (<https://www.unicollaboration.org/>) to support university educators involving their learners in telecollaborative activities. The European Telecollaboration for Intercultural Language Acquisition (TILA) project (<http://www.tilaproject.eu/>) offers a platform for secondary-school teachers and teacher training programmes in integrating telecollaborative practices in foreign-language education. TILA provides a collection of useful resources including pedagogical materials on telecollaboration, task samples, virtual classrooms, a partner searching tool, technical assistance, teacher training materials, various online tools and best-practice samples.

Challenges

There are some challenges in telecollaboration that learners, teachers and institutions need to consider. First, owing to

the often informal nature of telecollaboration, not all learners put in the same energy and engagement. Since most telecollaboration activities have been outside formal curricula or only partly supported by language teachers, the quality of the learning opportunities is substantially dependent on the commitment and motivation of all learners⁴. Second, some learners report cross-cultural tensions when working on language tasks, in particular when not all peer learners are equally committed to the learning goals or when insufficient time is spent on getting to know each other. Third, some recent studies highlight that not all learners benefit equally from telecollaboration. Institutions need to think carefully about how best to embed telecollaborations into their formal curriculum.

Conclusion

In the globalised world in which we live, work and learn today, learning a second language can bring many advantages for learners, such as further education, work and professional collaboration opportunities. Telecollaboration through online communication media has extended opportunities for language learning and cultural learning, particularly with respect to oral communication. Telecollaboration projects connect learners at a distance, enabling them to tutor others while also learning a chosen language as part of the same exchange. With the rapid development of telecollaboration, there have been emerging trends such as cross-disciplinary telecollaboration and teacher training in a telecollaborative exchange. These, along with telecollaboration for language learning, should continue to enhance learners' linguistic achievements and cross-cultural appreciation and communication.

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Evidence-based teaching

Using evidence from research to inform teaching

Potential impact: [High](#)

Background

Evidence-based or evidence-informed teaching is about using research evidence to inform decisions about the best pedagogical approach to teach a given domain¹. These decisions may relate to which teaching strategy to adopt in order to teach a specific topic, capturing the progress students make over time or assessing the effectiveness of one's teaching in general. The idea originates from medicine: medical practitioners often make use of evidence from robust research and experimental studies such as randomised control trials to learn more about diseases and treatments. They then combine this evidence with other information about their patients (such as their history and present symptoms) to make an informed decision about managing their health. Until recently, teaching has mainly relied on evidence from practitioner-collected wisdom such as observations of teaching practice or learning from colleagues, rather than studies that have assessed learning in a systematic manner².

There is a large variation in what teaching and learning look like in different contexts. For example, there are different teaching approaches, such as group work, inquiry learning or technology-enhanced teaching, and students have varied learning needs. This makes the production of generalisable evidence seem rather challenging. However, in recent years we have seen coordinated efforts to assess the effectiveness of teaching approaches that have evolved over time and have been used in teaching. For example, the idea that each student has a learning style, and that teaching should accommodate that style, has been widely referred to in teaching, with the suggestion that students with an 'auditory' style should learn from discussions and storytelling rather than writing. Evidence contradicts this popular notion³ and shows that there are no benefits from tailoring



teaching has mainly relied on evidence from practitioner-collected wisdom such as observations of teaching practice or learning from colleagues



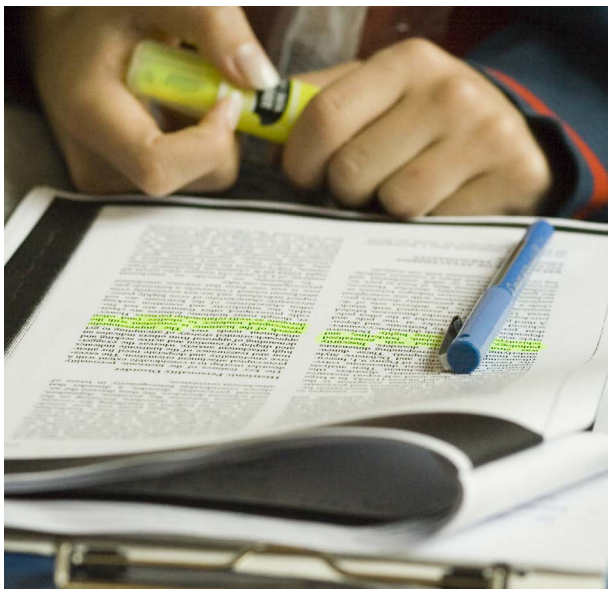
teaching to learning styles and that students learn best from multiple ways of representing information.

Another example is whether teachers should give secondary-school students homework, such as asking them to complete routine tasks, revise for examinations or prepare at home for class. Evidence shows that giving students homework can be effective, yet only under certain conditions⁴. Evidence-based teaching considers these conditions and follows recommendations that homework should:

- be focused on specific elements of learning rather than used as a routine task
- be accompanied by timely feedback from the teacher
- not be used as a 'punishment' for bad behaviour or poor performance
- be short (needing no more than two hours to complete).

Examples from practice

In the UK, the Educational Endowment Foundation (EEF) has produced robust evidence for a number of teaching approaches, among the most effective of which are the provision of good-quality feedback, the development of skills that can help students understand how they learn, and giving homework to students in the right ways⁴. For example, feedback is information given to a learner about their performance.



Reflecting on published evidence.

It is usually verbal or written and it can be about aspects such as the results of a test, the way a task has been solved or how a student manages their learning. Studies have shown that feedback on reading, mathematics or information recall can improve students' learning outcomes. To be effective, feedback should be specific, accurate and clear, and it should encourage and support effort and provide specific guidance on how to improve rather than stating only whether something is correct or incorrect. Thoughtful feedback matters a great deal when students are asked to complete a complex task, as this is a way to emphasise how important it is to be persistent and put effort into solving a challenging problem.

Another example of effective teaching based on evidence is mastery learning⁴, whereby a teacher organises the content of teaching into small chunks or units and defines the learning objective a student should achieve for each unit. Students work through each unit until they complete them all. To progress from one unit to the next one, students must achieve at least 80% in a relevant test. Those who do not manage to achieve this are provided with additional tuition, peer support or group discussions in order to be successful when they retake the test. Mastery learning works better when students work in groups and are responsible for supporting each other's

progress in the group. It is less effective when students work by themselves and at their own pace. Also, mastery learning works better when it is used to help students understand challenging topics or concepts, and should not be used for all lessons or for long periods of time.

In the US, the National Center for Education Evaluation and Regional Assistance (NCEE) has shown that, in the context of learning to read and write, training in phonological awareness and pedagogical techniques such as reading recovery and dialogic reading are beneficial for students⁵. For example, reading recovery is a form of one-to-one tutoring that can supplement classroom teaching. It is given to children in Year 1 and aims to support them in reading and writing and prevent long-term difficulties. Studies have shown that this approach can improve reading fluency and reading achievement. In dialogic reading, the child becomes the storyteller and the teacher or parent the listener or questioner. The teacher can ask questions that can prompt recall of the story, explain what is happening in a picture, relate book events to the child's experiences and ask questions (who, where, when, what, why). Studies have shown that dialogic reading has a positive impact on how children express themselves verbally.

In higher education in the UK, there are several universities setting up centres for assessing the impact of both distance and face-to-face teaching approaches to learning, by producing and reviewing research evidence. For example, the Institute of Educational Technology (and other units) at The Open University aims to improve student retention and performance in online and distance learning. The Durham University Evidence Centre for Education (DECE) aims to increase educational effectiveness and tackle inequalities. These centres design and implement studies that examine in a systematic manner how different approaches to teaching are perceived by students and what their impact may be on what is learnt. Findings from these studies are then published in journals, shared on websites and social media, and presented at conferences in order to reach teachers and inform their practices.

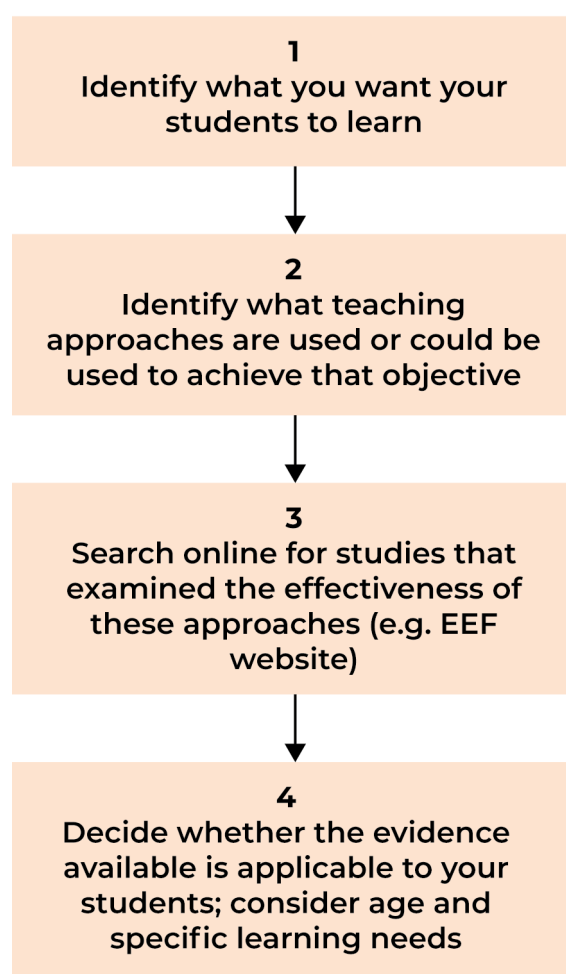
Barriers and challenges

Helping teachers recognise the value of research evidence and use it to inform their practices is not straightforward⁶. There is often scepticism in adopting evidence-informed recommendations and this may be due to teachers not being willing to change how they teach, or it may be that the expertise they gained over the years is perceived as more trustworthy or more relevant than any research evidence. It is also the case that, unfortunately, some published work may not be as high in quality as would be expected, and teachers may not have the time or expertise to recognise these lower quality publications. Therefore the quality of the evidence may be somewhat variable, leading to further mistrust of research findings.

Furthermore, such research findings are often published in academic journals that may not be accessible to teachers and educational practitioners, further widening the gap between the research findings and the potential for the work to have a greater impact. Websites such as The Conversation, and indeed these *Innovating Pedagogy* reports, can be useful in helping to bridge the gap between research and practice and to 'translate' academic writing into more readable and accessible text.

What helps in the translation of evidence into practice is when researchers collaborate with teachers to reflect on their needs, design studies and produce evidence together. Also, it helps if evidence is accessible to teachers, written concisely and fitting with existing practices and the educational reality of teachers and their working lives. Teachers should be supported to complement or inform their expertise with evidence, to strengthen their teaching and its impact on students' learning and development.

How to use evidence from research in teaching



Steps to follow when using evidence from research in teaching (EEF = Educational Endowment Foundation).

Conclusions

Evidence-based teaching can support teachers in identifying and applying best teaching practices, debunk harmful myths about teaching, and improve current teaching and learning. This can be a step towards bringing change to education and help students develop skills and knowledge for the needs of the 21st century. Evaluations of evidence-based teaching on a wider scale indicate that such evaluations should include looking at the nature of research and evidence as well as at how effectively the evidence is communicated and used.

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Corpus-based pedagogy

Using authentic language data to support language teaching and learning

Potential impact: **Medium**

Introduction

Corpus-based pedagogy makes use of a corpus, which is a collection of samples of naturally occurring language within or across diverse contexts (e.g. texts in English for academic purposes, forensic English or English produced by second language learners). It provides teachers and students with authentic linguistic data for teaching and learning. Corpus-based pedagogy has received much attention in recent years as a result of technological advances in computing science such as text mining (extracting information from text), searching and techniques for natural language processing. Software tools for processing a corpus can be used for linguistic research but also for language teaching and learning. In educational contexts, teachers can be trained to develop their professional knowledge and skills for corpus-based pedagogy. Learners can access online corpora with or without the help of their teachers, and they can analyse their own use of language by comparing their linguistic choices with the patterns and structures retrieved from a particular corpus.

Existing studies have revealed the effectiveness of corpus-based pedagogy in a range of language teaching and learning contexts. It can be applied to the teaching of languages for specific purposes, the acquisition of word collocations (words that often go together), teaching of text analysis (e.g. how linking words like 'however' are used in texts) and writing in a particular genre (e.g. ghost stories). The use of corpora as reference resources should be encouraged in future language pedagogy innovation, drawing on new insights from current research.

The most widely used and available English online corpora can be retrieved and downloaded from the website <https://www.english-corpora.org/> created by Mark



A word cloud showing frequently used words in this section; a larger size indicates greater frequency.

Davies, a retired professor of linguistics. The corpora have many different uses, including:

- finding out how speakers of a given language actually speak and write
- finding the frequency of words, phrases and collocations
- looking at how different languages or dialects vary and change (e.g. historical changes, differences between dialects and different genres)
- gaining insights into different cultures to develop cultural awareness (e.g. what is said about various concepts over time and in different languages)
- as authentic language teaching and learning materials and resources.



Corpus-based research has led to many discoveries about the nature of language use and language learning



Research and practice for a corpus-based pedagogy

Corpus-based research has led to many discoveries about the nature of language use and language learning. The potential of corpus-based pedagogy has been recognised worldwide. One example is an empirical study published by Basanta and Rodríguez-Martín in 2005¹. In their study, a data-driven learning approach was advocated. This approach aims to develop students' ability to see patterns in language and then form generalisations from those patterns. By means of the British National Corpus (BNC) Indexer and a powerful concordancer (Wordsmith Tools – software for finding patterns in text), the study created a small-scale corpus of face-to-face spontaneous conversations. The corpus can be used to investigate the most common patterns of these conversations. In this case, conversations in real contexts are collected and stored in a particular corpus. After corpus building, corresponding data-driven learning activities can be designed and implemented in language teaching.

Some ideas for designing corpus-based learning activities are as follows:

- testing students' knowledge – for example, detecting errors such as the misuse of prepositions owing to the influence of the speaker's first language
- hands-on corpus searches by students – looking for language patterns such as collocations of verbs and nouns (i.e. which verbs are accompanied by which nouns, and vice versa) or the frequency of collocations.

Word search is the main focus in corpus-based learning activities, but language patterns can be found at other levels of language use, e.g. sentence and text. The retrieval and analysis

of language use in context provides learners with a research-based understanding of language forms and functions.

Another application of corpus-based pedagogy exploration is the use of a corpus to gain perspectives on tasks and activities in textbooks, through linguistic evidence. In this case, corpus linguistics provides a good method for teachers and researchers to understand the pedagogies and routines foregrounded in textbooks. One example is an empirical study published by Hang and Cheuk in 2020². This study is a corpus-based analysis of instructional language in 14 English-language textbooks. Their findings suggest that there was an imbalance between the four skills (listening, reading, writing and speaking), a strong emphasis on grammar learning, a large number of group/pair work requests and a narrowly defined concept of literacy. In this study, instructional language in textbooks serves as linguistic data in a textbook corpus. As instructional language mainly consists of task purposes and actions to be carried out, it is suitable for understanding language teaching practices. We can examine the features of textbooks by observing the data and draw conclusions for syllabus design and materials development.

Challenges

Corpus-based pedagogy will continue to influence and inform language teaching and language learning in terms of materials development, curriculum design and implementation. However, there are some challenges. Since teacher involvement is crucial for successful implementation of corpus-based pedagogy, it is necessary to include such pedagogy in teacher training programmes, which may be challenging and complex³, though there is hope that such programmes will enhance teachers'

technological skills and pedagogical knowledge in general. Teachers also need to develop specific skills to be able to use corpus processing tools that will enable them to investigate language patterns and to use linguistic evidence from a corpus to inform teaching practice. Educational administration departments need to support teacher professional development in terms of policy making, teacher training and assessment. Students also need to possess specific skills or expertise in using corpus tools to facilitate the learning process, and time needs to be allocated to enable them to gain the necessary skills and experience.

Another challenge lies in the development of corpora that are accessible, diverse and adaptable for language instruction. Teachers may consider corpus building rather complex and time-consuming⁴. On the one hand, it may be difficult to collect genuine linguistic data across diverse contexts; on the other, it may be demanding to collect data continuously over a period of time.

This is especially true for a video corpus, which provides learners with a sense of real

contexts of language use. Since transcripts of conversations do not show features such as intonation, stress and body language, video recordings (or, for some purposes, audio recordings) are necessary if corpus-based pedagogy is to be used to facilitate the instruction of spoken language.

Conclusion

Corpus-based pedagogy facilitates language teaching and language learning in aspects of syllabus design, materials development and activities that may be done in class or out of class. It provides teachers and students with authentic linguistic data, which can be used repeatedly. The data stored in a corpus can be retrieved by software tools for corpus processing. In this sense, corpus-based pedagogy provides learners with a good opportunity for data-driven learning. However, this pedagogy has its challenges in terms of demands on teachers' knowledge and skills, requirements for students' aptitude and expertise, and difficulty in corpus building, which requires the investment of considerable time and effort by staff.

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